Electronic Collaboration in Norwegian Health Care
Actors and Trajectories – Status and Challenges

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Abstract
Electronic collaboration is identified as an important tool to support an upcoming reform of the Norwegian Health Care – the Coordination Reform. The goal of the reform is to prevent people from becoming patients and reduce the need for specialized care. The patients are also supposed to become more active in taking responsibility for their own health. The paper sums up the findings from a study that was done in order to get an overview of the status of electronic collaboration in the Norwegian health sector today, and the challenges that can be seen when in light of the coming reform. Based on the input from a reference group, meetings with users and available documentation, a situation analysis of six trajectories was performed. The main results from the work are summarized in a collaboration map that provides guidelines to which areas needs more focus for future development of collaborative systems. More effort should be put into innovative processes that support development of new collaborative systems.

Keywords: Collaboration, Health Reform, Core EHR, Standards

Introduction
ICT has been used as a tool to support the Norwegian clinician’s work processes for more than two decades. The first Norwegian EHR-systems were used by General Practitioners (GPs) as early as in 1984 [1]. 98% of the GPs have had these systems in daily use since 2001 and EHR-systems are also present at all Norwegian hospitals. These systems started as administrative tools, but have over time emerged to be systems that support daily clinical work-processes. 95% of the municipalities have ICT-systems that support administrative patient information, and 75% of the municipalities also use EHR-systems. The number of EHR-system vendors is limited to 2-4 vendors in each system group (GPs, municipalities, hospitals). In addition to the traditional EHR-system, the hospitals have additional systems that are used by the different specialists or for administrative purposes. The largest Norwegian hospitals will typically have 50-150 of these systems. Examples of such system are: Laboratory systems, PACS, medical charts, operation planning system, maternity ward system and intensive care system. The focus has also changed towards shared care that involves several caretakers in primary and specialized care. The electronic collaboration between the caretakers in different organizations has so far mainly been based on electronic messaging, but web-based solution and access to shared core medical information has also been tested. Deployment of electronic messaging has been much slower than expected. This has proven to be more related to organizational challenges than technical barriers [2].

The Norwegian health system has changed a lot since the first EHR-systems were developed. A major health reform in 2001 led to the organization of the 81 Norwegian hospitals under 4health authorities that are owned and supervised by the government. Primary care is the responsibility of local municipalities. Most GPs are working in private enterprises, in agreement with their local municipality.

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1 Growth volumes and coverage regarding use of EHR systems and message volumes are from [1] throughout the paper.
All patients are assigned to one GP’s patient list. All primary contacts with the health care system, except acute care, should be channeled through the GP. Most patients who are admitted to the hospital have been referred by their GP. When the patient has finished the treatment at the hospital, the normal procedure will be to return the patient to community care under the GP’s responsibility.

The Norwegian health system has obvious challenges that also are visible in other European countries. The hospital administration wants to keep the patient stay as short as possible in order to reduce hospital costs, but patients who have finished the specialized care they need at the hospital but are waiting for transfer to nursing homes or are not well enough yet to move to their own homes, are filling up hospital beds. As people live longer and longer due to better health care, more and more patients will need care on their elderly days. Many people are also rescued from a sudden death as early newborns or in traffic accidents, but may need specialist care for a long period.

A new coming Norwegian health reform - the Coordination reform- is expected in 2010. The reform will have focus on how the patient can be provided with more health care services in community care, closer to their homes, and reducing the need for expensive specialized care. Economic incentives are an integral part of the Coordination Reform, transferring money from the hospitals to the municipalities. The municipalities will then have to pay the hospitals according to the number of patients they refer to specialized care, and there will also be a high cost to pay for patients who have finished their hospital treatment, but occupy hospital beds until the municipalities are ready to receive them.

One of the goals of the health reform is also that electronic collaboration shall be preferred future means of collaboration between health workers in different organizations. This includes:

- Between service provider and patient/user: Examples of systems are: electronic booking, online consultations/telemedicine and access to own EHR.
- Between all groups of health users across organizational boarders.

**Methods**

The study was finished in August 2009. The main part of the work was done by a project team with three members from the KITH and NTNU.

The work was mainly based on available project reports and national strategy documents. The group had additional meetings with the Norwegian EHR research centre and a projects manager at one of the larger Norwegian Hospitals. The project team used an external reference group with members from:

- Innovation Norway
- The Norwegian Research Council
- Trondheim Municipality
- The Norwegian EHR Research Centre
- The Directorate of Health
- The Ministry of Health
- The Norwegian Centre for Telemedicine and Collaboration

The reference group had two physical meetings, and also participated actively in commenting on input from the project team. Based on the input from a reference group, meetings with users and available documentation, a situation analysis of six trajectories was performed. The main results from the work are summarized in a collaboration map that provides guidelines to which areas needs more focus for future development of collaborative systems.

**Results**

![Figure 1: Collaboration map](image-url)
The collaboration map (figure 1) summarizes the current status of electronic collaboration in health and social care. The x-axis shows the main actors, and the y-axis shows the trajectories that involve the different actors. A more detailed description of the trajectories is provided in the discussion chapter. For each collaborating actor, a color code and number indicates to which degree the prerequisites of ICT-supported collaboration are present. That includes both standards and ICT-systems that can be used for collaboration. The figure does not show to what extent the available solutions are used in practice.

The codes used are:

<table>
<thead>
<tr>
<th>Non relevant</th>
<th>Standards Are missing. Few systems with collaboration support implemented.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Some standards available Few systems with collaboration support implemented.</td>
</tr>
<tr>
<td>2</td>
<td>The most essential standards are available and several systems that can be used for collaboration are implemented.</td>
</tr>
<tr>
<td>3</td>
<td>Certified and standardized collaboration solution is commonly available.</td>
</tr>
</tbody>
</table>

The numbers are used as a support if colors are missing, and are also used to indicate an answer between to codes.

The collaboration map shows that the possibilities for standardized electronic collaboration are very limited in relation to preventive care, shared care, acute care and in relation to casual contact between patient and GP/dentist. Preventive care, shared care and the patient possibilities for administration of own health have been focused in the discussion about the upcoming health reform, and it is very concerning that these trajectories so far have been paid limited attention.

**Discussion**

**Basic requirements for electronic collaboration**

Electronic collaboration can be established by means of everything from SMS messages to video-conferencing, messaging and shared core information. Stand alone solutions can be feasible in some cases, but in a country where most health workers have access to EHR systems, a very common requirement is that the EHR system also should be the main platform for collaboration with other actors. Other requirements are:

- Access to a secure infrastructure for communication

Implementations of messaging systems should be based on standards and use of the Norwegian Cooperation Architecture [3]. A collaboration architecture for web services is also available. Basic requirements in this architecture are:

- All messaging traffic should use the national broadband infrastructure, The Norwegian Health Net.
- Only standardized messages should be used.
- ebXML framework should be used
- Application receipts should be sent for all messages.
- The vendor’s message implementations should be approved by the Norwegian Certification Service at KITH.

Messaging is based on CEN/TC251 standards for communication across organizational boarders and HL7 standards for hospital internal communication. The hospitals collaboration organization for ICT, National ICT, do also provide additional guidelines for development of systems in specialized care in their architecture document [4].

**The trajectories**

Only the trajectories that were regarded to be most essential by the reference group are included. They are:

1. Medical collaboration
2. Community care
3. Shared care
4. Acute care
5. Service and support functions
6. Preventive care
7. Interaction with the welfare system
8. Casual patient contacts with GP/dentist

**The medical trajectory**

The patient’s GP is the gatekeeper to specialized care in Norway. Annually 2 million referrals are sent from GPs. 25% of the referrals are related to cases where the patient is admitted to the hospital immediately, while the remaining 75% results in a contact at a hospitals outpatient clinic or an appointment with a private specialist. The responsibility for the patient will normally be transferred back to primary care, when the patient has finished treatment in specialized care. The discharge letter will be sent to primary care from the specialist or hospital.

**Status:** EHR systems are available and in use both by GPs and hospitals. Standards for electronic referrals and discharge letters are specified. The required
functionality for communication is specified and implemented by the vendors. Discharge letter are sent electronically by most actors, but the volume of electronic referrals is still low (less than 30%). Most systems are based on electronic messaging, but web-services are also used. It is a challenge that few hospitals can receive electronic referrals. Some nursing homes can receive discharge letters. Laboratory tests can be ordered from the GP’s EHR system, and laboratory answers will be sent channeled into the GP’s EHR system both from hospital labs and private service providers. Further work: Further work should include deployment of electronic referrals between hospitals, more specialized referrals, further work with web-services and solutions for communication with patient and relatives.

Community care trajectory
Many patients will need services in community care after they leave the hospital. This can include home care services, a short or long stay at a nursing home or rehabilitation service. The nurses at the hospital will try to get these services organized before the patient leaves. The patient can often depend on the services for a long period. Many patients will also be readmitted to the hospital, and it will then be necessary to inform the service providers that the patient does not need services for a while. Status: 65% of the nursing homes used EHR in 2008. At the same time 65% of the municipalities had started to use EHR, and 34% had introduced EHR in habilitation services. 6% of the municipalities have mobile solutions for home care and most of these use PDAs although research also has indicated that it is hard to document effects of these systems[6]. 36% of the municipalities are connected to the Norwegian Health Net. Standards for communication between hospital and community care have been established and are implemented in the EHR systems by the vendors. The use of these standards is limited at the moment, but a national project to support the introductions of the message based solutions is ongoing. 5% of the hospitals were communicating electronicaly with the community care in 2008, but a growth to 46% is expected in 2010. Many telemedicine projects have been initiated, but few are in daily routine use. Examples of telemedicine systems are systems where home carers can send photos of leg ulcers to the GP and specialist, mobile X-ray systems for use in nursing homes and in home care, and videoconferencing between hospital and health workers in community care. Further work: Electronic collaboration within community care and between community care and specialized care is still limited and should be prioritized in the coming years. Some projects that involve patients and relatives have been initiated, but in general more focus on these issues is needed.

Shared care
An increasing number of patients suffer from chronic diseases. The number of patients with diabetes, KOLS and chronic heart related conditions is increasing rapidly. These patients will often require services from specialized and community care simultaneously, and it is important that all actors have access to updated medical information about the patient. Status: Few electronic solutions that support shared care are in daily use today. Patient with chronic diseases have the right to have an individual plan that is used for coordination of the different task and services that are provided by the health workers. A plan coordinator in the municipality is usually responsible for the plan. Electronic individual plans were in use by 9% of the municipalities in 2008, and another 8% have planned to introduce electronic individual plan. The deployment phase of electronic individual plan has been slow. This is partly due to legislation, and the government’s resistance against sharing of information across organizational boarders, despite the fact that they have put pressure on municipalities in order to use the paper based version. It is an ongoing national process in order to change the legislation to make it easier to share information when necessary, but this process is slow, and the patients consent will be required. Pilot projects where core EHR-information can be shared across organizational boarders have been requested from many actors in the Norwegian health sector. Patient summary information with an overview of the patient’s contacts with different actors is also wanted. Sweden and Denmark have already implemented similar systems. National strategy projects and some initial projects have been initiated in Norway [5]. Patients with chronic diseases are only to a limited degree involved in taking care of own health by means of electronic collaboration. They often participate in support groups on the internet or for relevant documentation, but often want to use electronic mean for collaborations with nurses, GPs and specialists more actively. Access to their own EHR and possibilities for supplying the EHR with their own data is often very limited. Further work: More work is needed in order to establish systems where information can be shared among actors.
**Acute care**
Acute care comes into effect in emergency situations, when life is threatened and/or immediate medical/ambulatory assistance is required.  
*Status:* Acute care is supported by dedicated systems. However, EHR information, which often is critical for decisions to be taken under severe time constraints, can to a very little extent be exchanged between the actors in acute care, and the actors do not have immediate access to vital information collected in other EHR systems (medication, allergies, …).  
*Further work:* A planned national Patient Summary project is foreseen to give better support to acute care, but also solutions for electronic cooperation between the actors in acute care are needed.

**Service and support functions**
The responsible person for treating the patient, often require supporting services, as medication supply, laboratory examination and non-medical services such as transport.  
*Status:* Good coverage for laboratory responses for clinical chemistry, moderate coverage for requests. Some coverage for radiology, but communication via CD is still frequent. Requests for transportation handled in national system. ePrescribing is not in daily use, but an ambitious project is going on, with development of standardized communication as an integral part.  
*Further work:* Priority must be given to a standardized electronic exchange of radiology information. Implementation of the ePrescription solution will require significant efforts.

**Preventive care**
The Maternal and child health centers have the responsibility for health monitoring as well as immunization of the children until the age of 16. Pregnant women will also be in regular contact with these centers and the families will also have regular visits during the children school age. Pregnant women will always bring a pregnancy chart with updated information about her medical status to all appointments with the nurse at the health station, midwife, GP and the hospital ward.  
*Status:* 50% of the Maternal and child health centers in the municipalities have EHR systems. Less than 20% of the health stations were connected to the Norwegian Health Net in 2008, and collaboration with other actors is to a very little extent handled electronically. Standards to facilitate electronic reporting of immunizations are developed, but not in use.  
*Further work:* Maternal and child health centers should be connected to the health net, and standardized communication between the health stations and other actors like the GP, maternity ward at the hospital, school and the national registry of immunizations should be established. Maternal and child health centers must implement EHR systems. The electronic pregnancy chart should be developed and deployed. The patient should get access to quality assured information that can make it easier to manage own health and prevent from unnecessary visits to GPs.

**Interaction with welfare system**
The GP is the gatekeeper to the welfare system and will also assist the patient with application for services. The GP’s right to recommend welfare service are linked to the National Insurance Act that provides for the central national insurance and welfare schemes in Norway. The Norwegian Labor and Welfare Service administer a large proportion of the most important welfare benefits and social security schemes in Norwegian society. For example, these may be unemployment benefits, sickness benefit, rehabilitation allowance, disability pension, and retirement pension on reaching pensionable age.  
*Status:* 50% of the GPs were able to communicate electronically with the National Welfare System in 2008. This includes mainly Sick Notes and Medical Certificates. The first electronic Sick Notes were sent in 2004, but still only 25% are sent electronically, and the number has been fairly stable the last three years. The deployment process has been long, not only due to technical challenges, but also because of organizational obstacles. The benefits for the GPs have not been obvious, and requirements for electronic messaging have also been seen as a means to control the GP’s work.  
*Further work:* The GPs request systems for collaboration and not only one way reporting. The patients and user should also be provided with electronic services that make it easier to get knowledge about rights, admitted benefits and status of application processes.

**Casual contact patient GP/dentist**
Many of the patient’s with the GP or dentist do not require any referrals to specialized services. These contacts are not handled as acute, and the patient will contact GP’s or dentist’s practice or to get an appointment scheduled or just to get a prescription or renewed sick note.  
*Status:* 23% of the General Practices offered electronic patient services in 2008. An additional 12% had plans for establishing new services in 2009. The number of dentists who have electronic customer services was unknown by the time of writing, but it is likely that less than 10% have such systems. The
services that are offered are mainly booking of appointments, renewal of prescriptions, medical certificates and renewal of sick notes. Some GPs also communicate with the patients via a secure e-mail system. As a part of the national ePrescription system, the patients will also be offered services to keep track of their own prescription. 

Further work: Patient- and Customer services need to be extended. The patient should be provided with services that can assist in choosing and booking specialised care. The patient should also have easier access to quality assured documentation that can be used as an aid for self care.

Conclusion and suggestions for future work
The main findings from the work are summarized in the collaboration map. Solutions that should support shared care and empower the patient are to a large extent lacking. This is contradictory to the Cooperation reforms intention of empowering the patient, and should be focused in further developments. 

More effort should be put into innovative processes that support development of new collaborative systems. All actors that will be involved in collaborative processes must get some kind of benefits [7] from using new systems. If not, deployment is likely to be slow. The organizational challenges must not be overlooked, and focused in parallel with the development of new systems [8]. In order to be able to develop systems that work well in relation to daily work processes, it will be necessary to do more research in relation to the innovation processes [9].

Deployment of EHR-systems has been slow in Norway [1], but a similar pattern is also seen in other countries [10], [11], [12], [13], and must also be expected for new collaborative systems. Manual procedures are also likely to be kept in parallel with electronically based procedures because not all types of collaboration are suited for ICT-support [14].

References
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